NOTES ON A COLLECTION OF NUDIBRANCHIA (GASTROPODA: DORIDIDAE AND DENDRODORIDIDAE) FROM SOUTH AUSTRALIA WITH REMARKS ON THE SPECIES OF BASEDOW AND HEDLEY, 1905.

By Robert Burn.

Plate 1, Text figures 1-16.

Introduction.

Although only eleven species are represented in the present collection, three appear to be new to science and two are new records for South Australia. Coupled with the species of Basedow and Hedley's paper of 1905, the families Dorididae and Dendrodorididae are known by fifteen species, all from the general area of the Gulfs of that State. Only three other nudibranch species are recorded from the area, respectively representing the families Polyceridae, Arminidae and Scyllaeidae.

For this collection, the author wishes to thank the following persons. Mr. and Mrs. D. I. Hartley, Malvern, Victoria and Mr. and Mrs. R. Hall, Prospect, South Australia, for a parcel of specimens collected jointly at Coobowie, South Australia. Mr. D. Howlett of Ceduna forwarded several specimens collected at Ceduna Bay, and Mr. P. Trenberth of Tumby Bay forwarded specimens collected at Fiddlers Bay, Spencer Gulf. Miss J. H. Macpherson, National Museum of Victoria, Melbourne made available a single specimen of a remarkable species from Peak Bay, Spencer Gulf.

All the material examined and described here has been presented to the National Museum of Victoria, Melbourne, Victoria. Registered numbers for this material have been included here after the locality, date and collector.

Remarks on the Species of Basedow and Hedley.

In 1905, Basedow and Hedley presented the first and until now the only original paper on the members of this group from South Australia. Fortunately the figures and descriptions are very good and clear, for the specimens upon which they are based are either lost, destroyed, or in an unknown repository. Basedow, in 1904, presented several species to the Australian Museum, Sydney, among which is one labelled *Halgerda graphica* that must be regarded as a paratype of this species. The other species presented at the same time are at the moment incorrectly named and need careful examination before their specific identities are certain.

A summary of Basedow and Hedley's species is given here to show any necessary nomenclatural changes, and to clear up certain facts about them:—

Archidoris varia (Abraham). This widely distributed southern Australian species is actually an *Aphelodoris* Bergh, 1879, and should now be known as *Aphelodoris varia* (Abraham). The genital organs of the species at once separate the species from Basedow and Hedley's generic placement.

Archidoris staminea sp. nov. O'Donoghue (*Trans. Zool. Soc. Lond.*, 22 (6), 1929, p. 813) was the first to doubt that this species was really an *Archidoris* but did not advance any suggestions for its correct genus. The author (1957, p. 22) transferred the species to *Dendrodoris* and here further removes it to *Doriopsilla*.

Staurodoris pustulata (Abraham). This species proves to be another of Abraham's species, which from the examination of the type in the British Museum, Odhner considered it to be an *Austrodoris*. The species is represented in the present collection and the name for it is *A. peculiaris* (Abraham).

Alloiodoris marmorata Bergh is here transferred to the recently described species *A. nivosus* Burn 1958, and is shown to belong to a different section of the genus to the true *A. marmorata*.

Halgerda graphica sp. nov. Not represented in the present collection but recently recorded from Victoria by the author. The previously mentioned specimen in the Australian Museum, Sydney, is here designated as a paratype, its registered number is C. 1816.

Hypselodoris epicuria sp. nov. From the brief description of the radular teeth, this species should, in accord with Odhner's interpretation of the problem, be transferred to *Chromodoris* Alder et Hancock 1864. Apparently very rare as it has been collected only once.

Albania ? verconis sp. nov. Probably belongs to the "*Glossodoris*" group of genera and until it is again collected it must remain as an unknown quantity.

Ceratosoma brevicaudatum (Abraham). A very common species well represented in the present collection.

Ceratosoma adelaidae sp. nov. The juvenile form of the above species and as such it must be reduced to a synonym.

Doriopsis aurea (Quoy et Gaimard). Here shown to be a *Doriopsilla*.

Doriopsis carneola (Angas). Another *Doriopsilla*.

The three other species tabled by the two authors are *Scyllaea pelagica* Linne of cosmopolitan distribution, *Armina cygnea* (Bergh) formerly *Pleurophyllidia*, with a wide range across southern Australia, and *Tambja verconis* (Basedow et Hedley) formerly *Nembrotha ?* which has recently been made the type species of the Polycerid genus *Tambja* Burn (*Mem. nat. Mus. Vic.*, ante p. 98).

The remainder of this paper deals with the eleven species of the present collection of South Australian Nudibranchia. These species are systematically listed as follows:—

Family DORIDIDAE.

Subfamily CHROMODORIDINAE.

Hypselodoris saintvincentius sp. nov.

Subfamily MIAMIRINAE.

Ceratosoma brevicaudatum Abraham.

Subfamily DORIDINAE.

Alloiodoris nivosus Burn.
Austrodoris peculiaris (Abraham).

Subfamily DISCODORIDINAE.

Anisodoris flindersi sp. nov.

Subfamily ASTERONOTINAE.

Asteronotus (Tumbia) trenberthi subgen. et sp. nov.

Subfamily KENTRODORIDINAE.

Jorunna hartleyi (Burn).

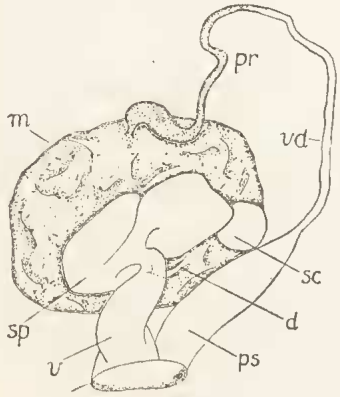
Family DENDRODORIDIDAE.

Dendrodoris nigra (Stimpson).
Doriopsilla staminea (Basedow et Hedley).
Doriopsilla aurea (Quoy et Gaimard).
Doriopsilla carneola (Angas).

HYPSELODORIS SAINTVINCENTIUS sp. nov.

Plate 1, figs. 1-2. Text figs. 1-2.

Diagnosis: Body broadly elongate ovate, mantle-brim wide, overlapping the head and foot except at the posterior end. Dorsal surface smooth, as preserved slightly wrinkled. Rhinophoral and branchial cavities with low smooth-rimmed sheaths. Rhinophores perfoliate. Branchiae twelve in number, simply pinnate, in a circle about the anal papillae. Oral tentacles represented by broadly triangular lobes either side of the mouth, each lobe with a low ridge on the ventral side and immediately away from this there is a deep pit angled towards the outer edges of the foot. Foot transversed anteriorly by a deep furrow, both lips notches medianly. The dimensions of the preserved type specimen are 14 x 8·5 x 7 mm. in length, breadth and height respectively, the larger paratype measures 18 x 10 x 7·5 mm. In life the specimens are about twice as long as the preserved length.



Text fig. 1.—*Hypselodoris saintvincentius* sp. nov. Distal genital organs.

The genital organs are quite typical of the Chromodoridinae. The penis is unarmed, the penial sheath strong and elongate. The prostate gland is a thickened portion of the proximal vas deferens, brown in colour; the remainder of the vas is narrow and short. The vagina is stout, short and yellowish in colour, the spermatheca is large and rounded, the spermatocyst elongate pyriform and twisted back upon itself. The uterine duct is short and narrow.

Text fig. 2.—*Hypselodoris saintvincentius* sp. nov. Various radula teeth.

The radular formula is 70 x 65.0.65, all teeth simply bifid at the tips. The extreme marginal tooth in each half row is simply hamate. Unfortunately the labial cuticle was lost before it could be examined.

The body colour in living specimens is reported to be spectacular, as preserved it has faded greatly. The body is bluish-grey, dark towards the margins and lighter medianly, everywhere marked with small yellow patches and dark blue or black dots. Underside of mantle and sides of foot similar to but lighter than dorsum; ridges on oral tentacles white; sole of foot bluish. Distal parts of rhinophores and branchiae pale pink. The living specimens are reported to have large patches of yellow along the margins and median part of the mantle; the rhinophores and branchiae have bright red or scarlet tips, and the oral tentacles are elongate digitiform.

Locality: Coobowie, west coast of Gulf St. Vincent. (three specimens, Dec. 1957, collected Hartley–Hall, type F20,757, paratypes F20,758).

Station: Under stones at low tide level.

Remarks: This species is undoubtedly the Flindersian Region representative of the Peronian species, *H. obscura* Stimpson 1855, which is also the type of the genus *Hypselodoris* Stimpson. The colouring of the two species is somewhat similar and the radular formula and shape of the teeth are very close. *H. saintvincentius* has probably developed independently through localization in the relatively warm waters of the Gulfs of South Australia.

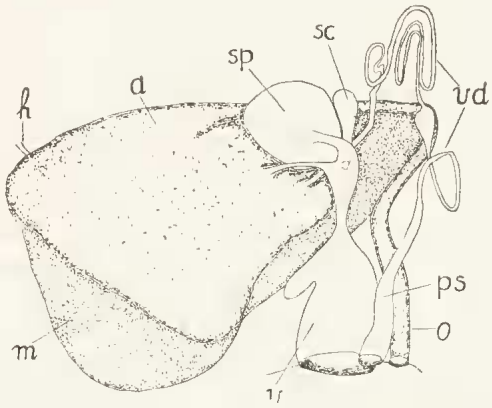
The use of the genus *Hypselodoris* is based upon the observations of Odhner (1957, p. 250-253), although when the full results of examination of the type of the genus *Glossodoris* Ehrenberg 1831 are known, a reconsideration of genera may be necessary. It would indeed be interesting to refind *H. epicuria* Basedow et Hedley 1905 from South Australia, to see if their generic placement is correct. This is doubtful as their brief remarks about the radula indicate the shape of the teeth is wrong for the present genus.

CERATOSOMA BREVICAUDATUM Abraham.

Text fig. 3.

Ceratosoma brevicaudatum Abraham, 1876, *Ann. Mag. Nat. Hist.*, (4), 18, p. 142, pl. 8, fig. 6.

This very common species is represented in the present collection by seven specimens from two localities. Basedow and Hedley have excellently described and figured the living animal from South Australia. O'Donoghue 1924 described and pictured the species from the Abrolhos Islands, Western Australia. In neither instance were the genital organs described or figured. This discrepancy is here rectified from an examination of the present material.



Text fig. 3.—*Ceratosoma brevicaudatum* Abraham. Distal genital organs.

The genital complex occupies most of the anterior of the body cavity and passes under the œsophagus to the left side. The mucus and albumen glands are large and elongate pyramidiform; the former gland is yellowish and the latter pink. The spermatheca is large and rounded, the spermatocyst much smaller and elongate pyriform; their position is vaginal (i.e. both vesiculæ debouch together into the top or upper portion of the vagina). The uterine duct is short and narrow; the vagina is very broad near its aperture and soon narrows to a brief constriction before again enlarging, but not to its apertural size, just below the vesiculae seminales. Below the constiction in the vagina there opens on the posterior side a short sac-like pouch, somewhat reminiscent of the reduced bursa copulatrix in certain of the DENDRONOTACEA. The oviduct is long, stout, and red in colour. There is no glans penis, the male aperture being merely a brief thickening of the distal vas deferens. Above this thickening the vas is muscular for quite some way and passes into a bulbous swelling and the intricately coiled and narrow prostatic portion.

The species in Victoria attains lengths of well over six inches (150 mm.), thus surpassing the dimensions given by Basedow and Hedley for their dredged material.

Localities: Coobowie, Gulf St. Vincent, (six specimens, Dec. 1957, collected Hartley–Hall, F20,759); Fiddlers Bay, Spencer Gulf, (one specimen, Dec. 1958, collected P. Trenberth, F20,760).

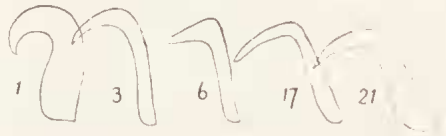
Remarks: This is a dominant species of the littoral marine fauna of the whole of southern Australia, from Sydney Harbour in the east to the Abrolhos Islands in the west. It is only rarely that minute and juvenile specimens are found and these do not truely resemble the adult species. Such was the case when Basedow and Hedley described *C. adelaidae*, a small species 8 mm. in length. A very large series at once establishes this to be the juvenile of *C. brevicaudatum* without the development of the colourful "brevicaudatum" or short tail of the mantle. Burn (1957, p. 18) has already placed *C. adelaidae* in the synonymy of the present species.

ALLOIODORIS NIVOSUS Burn.

Text figs. 4-6.

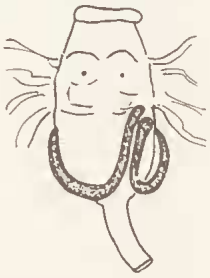
A. nivosus Burn, 1958 *J. Malac. Soc. Aust.*, 2, p. 29, pl. 2, fig. 14, text figure 6.
= *A. marmorata* Basedow et Hedley, 1905, *Trans. Roy. Soc. S. A.*, 29, p. 152, pl. 8, figs. 1-2, (non Bergh 1904).
= *A. marmorata* Burn, 1957, *J. Malac. Soc. Aust.*, 1, p. 19, (non Bergh 1904).

Although well described externally, this species has, particularly in South Australia, been known under several names including *A. hedleyi* O'Donoghue 1924, (from the Abrolhos Islands, Western Australia). Burn (1958, p. 29) discussed the problems of nomenclature surrounding this South Australian species, but as at the time there were no specimens available for examination he could not supply the answer to the problem. From the two specimens in the present collection, it can be safely stated that they are the same as the Victorian species, *A. nivosus* Burn, 1958. Details of the internal anatomy are given here.



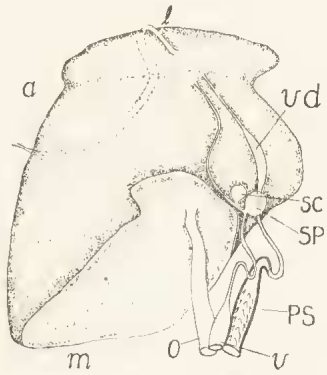
Text fig. 4.—*Alloiodoris nivosus* Burn. Various radular teeth.

The radular formula varies from 33 to 44 rows of teeth by 19-21.0.19-21. All teeth are simply hamate, the inner laterals have very short cusps as also have the marginals, the median laterals are large and stout. The labial cuticle is smooth and varies from very thin to quite strong, no armature is present.



Text fig. 5.—*Alloiodoris nivosus* Burn. Salivery glands, relationship to buccal mass, &c.

The salivary glands (text fig. 5) present a specific characteristic in their peculiar shape and position. They are long and slender, the left gland being always a little longer than the right one. From their points of origin on the buccal mass below the cerebral ganglia they pass backwards until level with the point of emergence of the œsaphagus from the buccal mass where both glands turn in towards each other, thus forming a complete U-turn. The left U-turn is broader than the right and so the distal portion of each gland is well to the right of the median line and lie parallel and very close together. In four specimens examined (two from Victorian localities) this position of the salivary glands upon the buccal mass was observed.



Text fig. 6.—*Alloiodoris nivosus* Burn. Distal genital organs.

The genital organs are simple in form. The vas deferens arises high up upon the genital mass and does not have a prostate gland. The penial sheath is strong, internally with about four vertical rows of 4-6 minute and simple hooks. The vagina is long and narrow with the spermatheca placed right at the top; the spermatocyst is very close by but not quite vaginal in position. The oviduct is long and rather slender. The spermatheca is, in relation to the size of the genital mass, very small, it is rounded in shape; the spermatocyst is pyriform and about half the size of the spermatheca. The hermaphrodite gland is a discrete mass and not spread over the liver.

Locality: Ceduna, Great Australian Bight, (two specimens, larger measuring 22·5 x 11 x 5 mm., 1958, collected D. Howlett, F20,761).

Station: Under stones at low tide, often in more sheltered positions.

Remarks: This species is closely related to *A. hedleyi* O'Donoghue, 1924 from the Abrolhos Islands, Western Australia and *A. inhacae* O'Donoghue, 1929 from Inhaca Island, South Africa. These three species when grouped together form a separate section of the genus, differing from the type in that they each lack denticulate radular teeth. The type, *A. marmorata* Bergh, 1904 from Ulverstone, Tasmania, has a very closely allied congener in *A. lanuginata* (Abraham, 1877) from New Zealand but they are sufficiently distinct so as to retain the two specific names.

After careful examination of a topotype specimen of *A. marmorata* Bergh at the Australian Museum, N.S.W., the author is convinced that O'Donoghue (1924, p. 249) is incorrect when he says that the outer two marginals on each side of the radula are denticulate, for here they were observed to be simple and the inner laterals denticulate. Whereas Bergh, 1904 did not observe a labial armature in his specimens of *A. marmorata*, the present writer noted the presence of a vestigial lining similar to that of *A. lanuginata* (Abraham).

A key to the five species of *Alloiodoris* can thus be tabulated:

A. Inner lateral radular teeth denticulate. Labial armature present but often vestigial.

(i) Colour grey with a number of brown spots. Dimensions 45 x 25 x 13 mm. Radular formula 35 x 40—42.0.40—42.

A. MARMORATA Bergh, 1904.

(ii) Colour reddish grey with numerous brown spots. Dimensions 50 x 33 x 16 mm. Radular formula 26 x 40—45.0.40—45.

A. LANUGINATA (Abraham, 1877).

B. All radular teeth strongly hamate. Labial armature generally absent.

(i) Colour dark muddy-fawn with numerous roughly circular ringshaped brown markings on the dorsum. Dimensions 52 x 34 x 23·5 mm. Radular formula 33—35 x 55—57.0.55—57.

A. HEDLEYI O'Donoghue, 1924.

(ii) Colour dirty yellowish-grey, dorsally with numerous irregular indefinite brown-black blotches and lines, mostly about the margin of the body. Dimensions 47 x 31 x 12 mm. Radular formula 67 x 67.0.67, (a row of rhachidial plates may be present). A very narrow labial armature is reported to be present.

A. INHACAE O'Donoghue, 1929.

(iii) Colour white or pale grey, when pale grey usually with a few large brown circular ring-like patches, each with a white centre. Dimensions 22·5 x 11 x 5 mm., (specimens up to 30 mm. in length have been collected but not examined). Radular formula 44 x 21.0.21.

A. NIVOSUS Burn, 1958.

The genus *Alloiodoris* is apparently an austral one limited to the temperate and cool-temperate seas of South Africa and Australasia. The internal anatomy of each of the five species known is remarkable in that the hermaphrodite gland is formed into a compact mass and not spread over the liver as in all other Dorididae.

AUSTRODORIS PECULIARIS (Abraham).

Text figs. 7-9.

Doris peculiaris Abraham, 1877, *Proc. Zool. Soc.*, p. 211, pl. 29, figs. 15-17.

= *Staurodoris pustulata* Basedow et Hedley, 1905, *Trans. Roy. Soc. S. A.*, 29, p. 151, pl. 9, fig. 3, (non *Doris pustulata* Abraham, 1877).

= *Archidoris varia* Burn, 1957, *J. Malac. Soc. Aust.*, 1, p. 20, (non *Doris varia* Abraham, 1877).

Basedow and Hedley came very close to the correct genus when they placed their species, *Staurodoris pustulata,* in that genus but their specific designation is unmistakably incorrect. Similarly Burn, 1957, finding the same species, was misled by Basedow and Hedley's reference to the genus *Archidoris* Bergh, 1878, and, in turn, used a specific name which is now known to refer to a species of *Aphelodoris* Bergh, 1879. By careful examination of both external and internal anatomy, the species proves to be one described by Abraham, 1877 from Port Lincoln, South Australia.

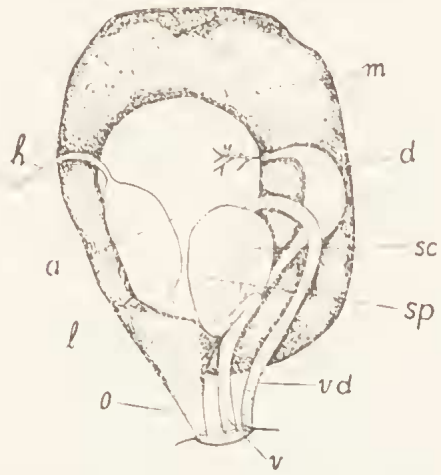
Text fig. 7.—*Austrodoris peculiaris* (Abraham). Lateral detail of the left rhinophore and sheath showing the large rear lateral pustule and its median partner.

Examination revealed the following points of interest about the species.

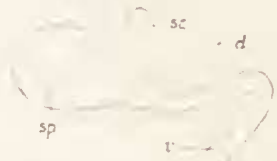
The pustules of the mantle are largest preanally and all have darkened centres. The rhinophores (text fig. 7) are each surrounded by a circlet of pustules, the largest rear-lateral and the second largest rear-median. The branchial sheath is finely pustulated along its margin, a row of eight varying sized pustules form a semicircle around the anterior edge of the sheath. Branchiae five in number and well separated, anus protrudes between rear two plumes; the branchial cavity is very close to the posterior end of the body. The tail extends beyond thte mantle, persisting even in preserved material. The oral tentacles are very tumid and indistinct.

As a specific characteristic of spirit specimens, one might add that in most of the material examined there is present an underlying purple patch just in front of the branchial cavity; this is the blood gland. It is only rarely that this patch is not present.

The radular formula is 25—37 x 65—68.0.65—68. All teeth are simply hamate, increasing gradually in size from the rhachis outwards, outermost few diminishing a little. Without a labial armature.



Text fig. 8.—*Austrodoris peculiaris* (Abraham). Genital organs viewed dorsally *in situ*.



Text fig. 9. *Austrodoris peculiaris* (Abraham). Detail of the position of the vesiculae seminales in relation to the vagina and uterine duct.

The genital organs are as usual in *Austrodoris*. The vagina is short and stout with the vesiculae seminales vaginal in position. The lower vas deferens is strongly cross ridged by muscles while the remainder is slender and without sign of any prostatic swelling. The ampulla is broad and flat. The spermatheca is large and round, the spermatocyst much smaller and pyriform.

One specimen of this species is among the present material, the dimensions are 19 x 8 x 5 mm. in length, breadth and height respectively.

Locality: Ceduna, Great Australian Bight, (one specimen, 1958, collected D. Howlett, F20,762).

Station: Similar to that of *Alloiodoris nivosus* Burn, on the reef at Ceduna Bay.

Remarks: Abraham's figures of this species agree very closely with the present specimen although here the pustules of the mantle are a little coarser. Odhner 1934 mentions that he had examined the type specimen of *Doris peculiaris* Abraham and was inclined to class it as an *Austrodoris*. Pruvot-Fol. (1951, p. 41 and footnote p. 40) claims that this species is a *Dendrodoris* and of Mediterranean origin, and that perhaps it is a *Doriopsilla* closely related to an insufficiently described species from Portugal. But as Abraham gave the type locality, Port Lincoln, in his description, there can be no doubts that the present specimen is in fact his species. Odhner's brief remarks substantiate the use of the genus *Austrodoris*.

Each of the references cited in the synonymy give good descriptions of the external characters of this species.

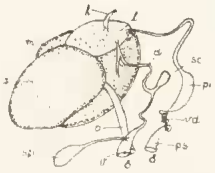
ANISODORIS FLINDERSI sp. nov.

Plate 1; figs. 6-7; Text figs. 10-12.

Diagnosis: Body broadly oval, rather flat, as preserved the specimen is strongly curled but when flattened the dimensions are length 40 mm., breadth 15 mm. and height 8 mm. The mantle margin is undulating in outline; beyond the body the mantle is thick and muscular, above the body it is thinner and not so tough; everywhere covered by low soft pustules, small and close together near the margins, somewhat larger and sparser over the body. Dorsally along either side of the body there is a row of five large elevated pustules, spaced well apart, commencing in front of the rhinophores and ceasing in a pair behind the branchial cavity. A short distance in front of the branchial cavity is a secondary pair of large pustules placed nearly evenly between the two lateral rows of pustules. The rhinophores are well forward and close together, perfoliate with at least seven fine lamellae; sheaths elevated, much more so than the pustules of the two lateral rows, each sheath is composed of four or five distinct pustules. Branchial cavity is large and elliptic; margin thin, irregularly crenulate and lowly elevated; the branchial plumes number six and each is tripinnate. The postbranchial measurement is 8 mm. The foot is narrow, contracted and curled in towards the centre, at present it is about one-third the width of the mantle; the edges are thickened, the sole is faintly grooved; the tail is quite long but does not extend beyond the posterior mantle, anteriorly the foot is bilabiate and medianly indented (not notched). The underside of the mantle and the sides of the foot show very fine white muscular fibrillae, similar to that of *Doriopsilla* spp. The oral tentacles are short, digitiform, as preserved they are severely contracted.

Text fig. 10.—*Anisodoris flindersi* sp. nov. Dorsal view of preserved type specimen, ends strongly curled under.

Internally the salivary glands (text fig. 12A) are long, narrow and band-like, the distal ends are slightly swollen and curved in towards each other until they nearly touch.



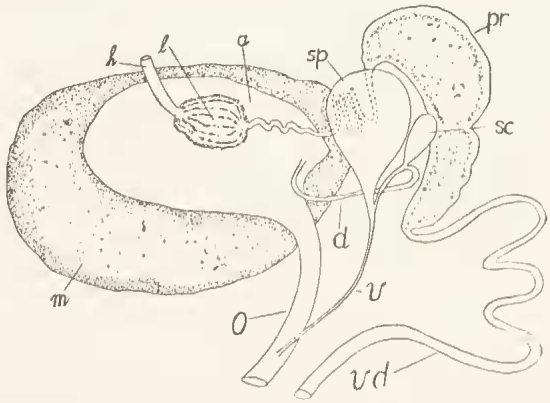
Text fig. 11.—*Anisodoris flindersi* sp. nov. Distal genital organs.

The genital organs (text-figure 11) show a very remarkable departure from that which is typical of the genus, particularly in respect to the female ducts and seminal vesicles and the ampulla of the hermaphrodite duct. The ampulla is very large, flat and somewhat cushion-shaped, not thick and twisted as in other species (vide Odhner 1926, fig. 70; Marcus 1959, fig. 97, 103, 107). The hermaphrodite duct enters the ampulla at the top centre, the male and female ducts debouch peripherally on the right side. The female duct bifurcates shortly away from the ampulla, one branch, short in extension, connecting to the mucus gland, the other forming the uterine duct. The male duct is long

ASTERONOTUS (TUMBIA) TRENBERTHI subgen. et sp. nov.

Plate 1, figs. 3-5. Text figs. 13-14.

Diagnosis: Body broadly elliptic, flattened, dimensions 33 x 17 x 8 mm. The mantle edges are very thin and grossly undulate, unevenly indented and folded over all round. The median part of the mantle over the body is ornamented by one strong mid-dorsal crest and two weaker indistinct lateral crests. The main crest commences in front of and between the rhinophores and terminates a little in front of the branchial cavity; it consists of a row of irregularly sized and spaced low hard pustules surmounting a low ridge. The lateral crests are much shorter than the median one and are lower and far more irregular in size and spacing. Between the crests the skin is wrinkled into a reticulate or stellate pattern, the low pustules of each crest forming the centres for the stellate patterning, a few simple elevated pustules are present between the three crests and these form the centres for secondary stellate reticulations. Beyond the body proper, the mantle is everywhere covered by small elevated pustules which are larger towards the body where a few intermix with the reticulations of the body surface. All the pustules of the mantle contain a circlet of short spicules which in places briefly protrude. The rhinophore sheaths are slightly elevated, the margin is composed of a circlet of low dentations or teeth. Rhinophores perfoliate. The branchial cavity is large and somewhat transversely elliptic, the margin is slightly raised; the branchiae number two, one on either side of the anal papilla, bipinnate; the rhachis of each plume is strong and broad, the minute pinnae of the edges few and small. Ventrally the foot is narrow, about one-third the width of the mantle (6 mm. broad in the type specimen) and very nearly as long as the overall length of the mantle. The foot edges are thin and very much undulated, the sole is shallowly grooved. Anteriorly it is bilabiate, the upper lamina being broadly and deeply cleft. The oral tentacles are cylindro-conical or digitiform and are rather linear. The underside of the mantle particularly near the edges is minutely granular. The genital orifice is large, high up under the mantle, and just behind the line of the rhinophores.



Text fig. 13.—*Asteronotus (Tumbia) trenberthi* subgen. et sp. nov. Distal genital organs.

The genital complex is large and occupies most of the anterior of the body cavity, in fact the buccal mass is pushed far to the left against the left wall of the cavity. The mucus and albumen glands are very large, the former

and narrow and swells to form an elongate prostate gland, beyond which, as usual, the vas deferens is very narrow, short and inticately twisted before it enters the shallowly curved, swollen, unarmed penial sheath. The female duct has the spermatocyst of the usual pyriform shape with its entry into the uterine duct through a constricted portion. The spermatheca enters the female duct at the part regarded by the author as the vagina, it is a pyriform pouch at the end of a long narrow tube the base of which is minutely swollen upon the vagina.

If one did not interpret correctly the positions of the seminal vesicles, the spermatheca at the end of its long duct might appear to be a dart sac or penial gland as in the Kentrodoridinae (vide *Jorunna hartleyi*, text fig. 16, *pg*). The peculiar ampulla and its connection to the mucus gland through the upper uterine duct may be merely an abnormality in the single specimen available for study. Further material will either confirm or deny the present position.

Text fig. 12. *Anisodoris flindersi* sp. nov. A. Salivery glands in relation to buccal mass. sg salivery glands. B. Various teeth from a half row of the radula.

The radular formula is 25 x 38.0.38, all teeth hamate, the innermost more strongly curved than the medians and marginals. The innermost teeth are the smallest and then gradually ascend in size until the sixth or seventh from the margin, after which they decrease slightly. The labial cuticle is smooth and lacks all armature.

The body-colour is dark greyish brown; laterally the mantle is yellow and fawn in alternating patches; the large pustules of the dorsum are yellow. The branchiae are dark grey-brown, the rhinophores fawn. Ventrally the body is pale yellow with the whitish muscular fibrillae everywhere. The sole of the foot is yellow and the margins orange. As no colour notes are available, the living animal may be quite different to that as preserved, although it is now in a solution of formalin.

Locality: Peak Bay, Spencer Gulf, (one specimen, 16th February, 1956, collected J. H. Macpherson, F17,482).

Station: In the littoral zone.

Remarks: This species represents a new genus in Australian seas, the presence of a prostate gland distinguishing it from externally similar genera of the Doridinae (i.e. *Archidoris* and *Austrodoris*). The very narrow foot, two rows of well spaced large pustules, and colour scheme separate *A. flindersi* from any other Australian Dorididae described to date. It is possible that *A. flindersi* is of fortuitous occurrence in South Australia and that its true locale is further westward in the much warmer waters of Western Australia.

surrounding the latter for the most part. The oviduct is long and broad, the vagina enters the oviduct close to its aperture. The spermatheca is small, rounded or subpyriform, red in colour; the spermatocyst is even smaller than the spermatheca, elongate pyriform and yellow-cream in colour; it is connected to the short and narrow uterine duct by an extremely narrow tube. The vas deferens is simple, briefly undulated and without a penial swelling or armature; it emerges from the large partially divided black prostate gland which is spread thinly over the right dorso-lateral side of the buccal mass just behind the cerebral ganglia. The upper part of the prostate is the larger and is separated from the lower portion by a yellowish transverse band inside the gland. Between the prostate and the ampulla the male duct is stout and convoluted. The ampulla is irregular in shape and composed of a sponge-like glandular mass; it is cream in colour.

Text fig. 14.—*Asteronotus* (*Tumbia*) *trenberthi* subgen. et sp. nov. Various teeth from the radula.

The radular formula is 19 x 27.0.27. All teeth are hamate, the median laterals strongly so, the largest tooth is the seventh or eighth from the margin. The two inner laterals either side of the rhachis are bifid at or very near the tip. Similarly bifid is the marginal tooth of each row. In the two partially formed rows of the radular strip the inner and outer six or so teeth are bifid with extremely long and curiously undulatory cusps; in the third row the lower cusp has degenerated into a small denticle on the lower side of the tooth and the upper cusp has thickened and lost its undulations. Most of the outer and inner median laterals exhibit a shallow groove just behind the tip of the cusp, apparently a carry-over from the junior rows with their long cusps. The inner lateral has one other characteristic which is very apparent in lateral view; this is the strong diverging shoulder of the basal portion of the tooth. The labial cuticle is smooth and thickened on the walls of the anterior opening. The oral tube from the mouth aperture to the radular or buccal mass is long and strongly muscled, narrow at the mouth, and greatly constricted by a muscular ring immediately in front of the radula. The inner wall of the oral tube is provided with six or eight tough longitudinal flesh ridges, each ridge armed with a number of large, strong papillae which are almost strap-like in appearance. As mentioned above the buccal mass is pushed right to the left of the body cavity by the genital complex; the radula instead of protruding downwards as in other Dorididae is here observed to protrude from the left-ventral side of the buccal mass. The cerebral ganglia of the nervous system is situated not above the buccal mass but medianly near the prostate gland.

The colour of the living animal, according to the collector, is " outstanding, a triumph for the beauty of nature ". In preservative, the colour of the mantle medianly is dark brown-grey, the stellate reticulations are fawn as are also the pustules between the crests; laterally the mantle is yellowish-fawn with numerous small red or orange patches showing through from the underside of the mantle. The pustules of the median and lateral crests are all black capped, usually surmounted on reddish flesh. All the lateral pustules of the mantle contain a circlet of black spicules, this providing a noticeable black

ring on the top of each pustule. The branchial cavity is surrounded by minute black and yellow alternating patches. The rhinophores and the ramifications of the branchiae are purple-brown. About the margin of the mantle underside are numerous large irregular patches of pale orange, (when alive these are bright red). The remainder of the undersurface is pale pinkish-grey; the sides of the foot and head are heavily flecked about the edges with fine black spots, which higher up become large and sparser and disappear completely at the turn of the foot into the mantle. Sole of foot yellowish-orange, without any markings.

Locality: Fiddlers Bay, south of Cape Bolingbrook, Spencer Gulf, (two specimens, Dec. 1958, collected P. Trenberth, type F20,763, dissected paratype F20,764).

Station: Collected by torch-light at night in shallow water on the grape weed, *Hormosira banksii.*

Remarks: The two specimens are excellently preserved, the colour has faded very little and no distortion has occurred at all. This record adds another genus to the list of Dorididae of South Australia and is the fourth species of the genus known from Australia.

The remarkable bifid radular teeth may be merely an aberration but until further material is available for examination this point cannot be checked. In case the species is found to be consistent, then the subgeneric name *Tumbia* subgen. nov. is here provided for it. Other characteristics of the species, i.e. long oral tube with papillae, buccal mass to the left of the body cavity, and genital organs with divided prostate gland, are the same or similar to described species of *Asteronotus*. The bifid undulations of the junior rows of teeth, particularly in the case of the marginal one, are very similar to *A. madrasensis* O'Donoghue 1932 although there the marginal has only the one cusp.

JORUNNA HARTLEYI (Burn).

Text figs. 15-16.

Rostanga hartleyi Burn, 1958, *J. Malac. Soc. Aust.*, 2, p. 28, pl. 2, figs. 12-13, text fig. 5.

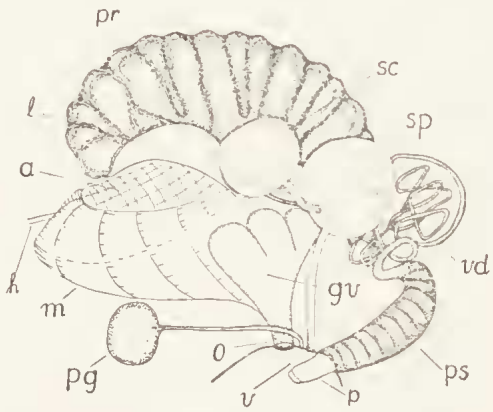
Little need be added to the original concerning external features but here the radula is refigured as that originally described and figured is quite wrong.

As originally stated the rhinophore sheaths are large, they are also rather elevated, the branchial sheath is not so much elevated. The villous papillae of the mantle are very strong, flat topped and somewhat sparsely spaced.

In preserved material the oral tentacles are short, stout and digitiform; the anterior of the foot is shallowly bilabiate with an incised upper lip; the colour is reddish-brown, foot pinkish and orals white.

Text fig. 15.—*Jorunna hartleyi* (Burn). A half row of teeth from the radula.

The distal genital organs are very complex and compact. The male portion is provided with a large and curiously shaped prostate gland with both the vas deferens and upper male duct from the albumen gland debouching from and entering into a common arm or branch of the prostate. The vagina is narrow and equipped with a large spherical spermatheca; the uterine duct debouches separately into this vesicule, and the nearly as large spermatocyst issues into the uterine duct a short distance away from the spermatheca. The ampulla is large, elongate and narrowly constricted at either end. The penial gland has a long slender duct connecting it to the genital atrium, the upper end is swollen into a spherical sac; no dart or stylet was found. The oviduct has a set of three vestibular glands on its dorsal side and not far from the aperture. The distal part of the vas deferens is slightly swollen into a penial sheath with strong transversely muscled walls; between the prostate and the penial sheath it is very long and narrow, and intricately coiled and wound. The penis is short, cylindrical and unarmed, apically a little constricted and narrower.



Text fig. 16.—*Jorunna hartleyi* (Burn). Distal genital organs; the penial gland (pg) has been moved to the left to show the vesiculae seminales.

The radular formula is 22 x 18—22.0.18—22. Inner lateral simply hamate, narrow and elongate. Succeeding five laterals lie over each other towards the rhachis. Except for the outer five or six slender curved teeth, all the teeth are simply hamate but the cusps are not long in relation to the base as that of the inner lateral. There is no labial armature, the cuticle is quite smooth.

Locality: Coobowie, St. Vincent Gulf, (one specimen, Dec. 1957, collected Hartley–Hall, F20,765).

Station: Under stone at low tide level.

Remarks: The presence of a large prostate gland and a penial gland necessitates the transfer of this species from *Rostanga* Bergh, 1879 to *Jorunna* Bergh, 1880. The flat topped villous papillae of the mantle and the form of the radula add further to the weight of this transfer. The genus *Jorunna* has not previously been recorded from Australia. The species is not an uncommon one at various localities in Victoria where the type locality is Breamlea.

Family DENDRODORIDIDAE.

This family contains two genera, *Dendrodoris* Ehrenberg, 1831 and *Doriopsilla* Bergh, 1880, the latter has formerly been regarded as a subgenus of the former. It is most probable that *Dendrodoris* should be further divided into subgenera or perhaps even genera on the basis of either (i) the presence of strong compound tubercles on the dorsum and very large size of animal, e.g. *D. tuberculata* (Quoy et Gaimard, 1832) or (ii) the presence of low smooth blister-like pustules on the dorsum, e.g. *D. nigra* (Stimpson, 1855). Other separative characters might be the two forms of rhinophores, straight or bent at near right-angles at mid-length.

Together with the Phyllidiidae, the Dendrodorididae constitutes the section POROSTOMATA of the Doridacean Nudibranchia (Marcus, 1957, p. 446), both families characterized by the absence of radula and jaws, the Phyllidiidae further by the lack of branchiae about the dorsal anal aperure.

Genus *DENDRODORIS* Ehrenberg.

The members of this genus are usually large, soft and slimy. The dorsum is often ornamented by large soft, either rounded or tuberculose warts, or sometimes it is covered by large or small soft blisterlike pustules, or more rarely it is smooth. The body length varies from 20 mm. to in excess of 150 mm., the ratio between breadth and length is 1:2 or 1:3. The mantle edge is thin and often strongly and grossly undulate, similarly the foot margin is undulate but usually less strongly. The foot is very broad, as wide at least as the body proper, ends rounded but more narrowly in front. The head is exceedingly small but is always noticeable; the oral tentacles are merely lobiform thickenings of the sides of the head. The branchiae are always large, tri- or polypinnate, very bushy and varying in number from 4 to 8. The perfoliate rhinophores are of either of two forms, the first and more common being simply conical-clavate, the second having the clavus bent rearwards at near right-angles to the stem. Both rhinophores and branchiae are retractile within large simple rimmed cavities. There is no radula or labial armature; instead of these there is a suctorial complex. The genital complex is as usual in the DORIDIDAE; the penis is armed by rows of strong spines or hooks.

There are about a dozen species of *Dendrodoris* at present known from the Australian coastline. These are listed below along with their present known distribution.

D. gunnamatta Allan, 1932———New South Wales.

D. mammosa (Abraham, 1877)———Western Australia: probably this species needs a new name as the same name is also used for a New Zealand *Dendrodoris*. The type specimen has no locality.

D. rainfordi Allan, 1932———Queensland.

D. tuberculata (Quoy and Gaimard, 1832)———Queensland. (= *D. morulifer* Allan, 1932———Queensland).

D. vadisi nom. nov.———Victoria: this new name is necessary for *D. davisi* Burn, 1957 which is generically separate from *Doriopsilla davisi* (Allan, 1933), a species originally designated as a *Dendrodoris,* and which is found along the N.S.W. coastline but not in Victoria. The type specimen of *D. vadisi* is in the National Museum of Victoria, registered number F20,974, locality Portarlington; station common under stones at low tide level, particularly so if the stones have a muddy sediment covering their undersurfaces. For description of species see Burn, 1957.

D. albobrunnea Allan, 1933———Queensland.

D. guttata (Odhner, 1917)———Western Australia.

D. nigra (Stimpson, 1855)———New South Wales, Victoria, South and Western Australia.

D. maugeana Burn, 1961 (ante p.)———Victoria.

D. denisoni (Angas, 1864)———New South Wales, Queensland.

D. albopurpura Burn, 1957———Victoria.

Probably many more species will be recorded from the Australian Region in future years as careful and systematic collecting is undertaken at previously untouched parts of the coastline. The *Dendrodoris* in the present collection is a common species with a distribution throughout the whole of the Indo-Pacific.

DENDRODORIS NIGRA (Stimpson).

Doris nigra Stimpson, 1855, *Proc. Acad. Nat. Sci. Philad.,* 7, p. 380.

This cosmopolitan and well described species is here added to the South Australian fauna, thus completing the distribution of the species throughout the southern states. Previously it has been recorded from Western Australia (O'Donoghue, 1924), New South Wales (Allan, 1932, 1947), and Victoria (Burn, 1957).

The present specimens are quite typical, black all over except for a narrow red band around the mantle-brim. The largest specimen measures 17 mm. in length and is very much contracted.

Locality: Coobowie, St. Vincent Gulf, (six specimens, Dec. 1957, collected Hartley–Hall, F20,766).

Station: Under stones at low tide level.

Remarks: The ever apparent body-colour of *D. nigra* does away with any necessity to examine the anatomy in relation to other species of *Dendrodoris*. The amount of colour variation in specimens from different localities is very considerable, but always the body-colour is black.

Genus *DORIOPSILLA* Bergh.

The species referred to this genus all have hard mantles, either granular (to varying degrees) or ornamented with a few low soft and simple papillae. The presence of calcareous spicules creates the hardness of the mantle. The body length rarely exceeds 50 mm., the smallest species is about 10 mm.; the breadth is generally more than half the length. The foot is broad, often wider than the body proper; the edges are thin and evenly undulate, the ends taper quickly and are narrowly truncate. The head is minute, in fact little more than the mouth aperture is apparent. The branchiae are few in number, usually 4 or 5, small and tripinnate; retractile. The rhinophores are conical-clavate, perfoliate and retractile. Rhinophoral and branchial cavities with simple edges. There is no radula or labial armature, but the presence of the buccal ganglia close behind the pedal ganglia differentiates the buccal complex from that of *Dendrodoris* where the distance between the two ganglia is considerable. The penis is armed with strong hooks, in some cases in spiral rows.

The three species here referred to *Doriopsilla* are in each case separable by their body-colour which generally remains even in preserved material. A simple key to the four Australian species can be laid out as follows:—

1. Mantle with scattered low soft papillae.
   - (i) Colour bright (chrome) yellow, sometimes white. Length up to 45 mm.—*D. staminea* (Basedow and Hedley, 1905).
   - (ii) Colour entirely red or orange, often with a few scattered white punctae. Length up to 40 mm.—*D.aurea* (Quoy and Gaimard 1832).
   - (iii) Colour varying from bright orange to pale orange, more often than not with white punctae or splashes over the dorsum. Length up to 35 mm.—*D. davisi* (Allan, 1933), (N.S.W.).
2. Mantle granular
   - Mantle dark red or brown, sole of foot yellow or white. Length up to 25 mm.—*D. carneola* (Angas, 1864).

Beyond Australia, *Doriopsilla* is represented by six or seven species, two or three of which are from the Atlantic, the remainder from the Indo-Pacific.

DORIOPSILLA STAMINEA (Basedow and Hedley).

Archidoris staminea Basedow and Hedley, 1905, *Trans. Roy. Soc. S. A.*, 29, p. 151, pl. 6, figs. 3-4.

This is a very common South Australian species extending well eastwards along the Victorian coastline. In the present collection there are ten specimens from the Gulfs of South Australia, the dimensions range from 15 x 12 x 7 mm.

to 35 x 18 x 11 mm. The prominence of the low dorsal papillae varies from specimens to specimen; in some specimens they are very prominent and clearly defined, in others very low or contracted, so much so that they may appear merely as pale smooth patches of skin. The branchiae are five in number, coarsely and sparsely tripinnate; the anal papilla is between the rear two plumes, all retractile within a deep, low and smooth margined cavity. The rhinophores have similar low smooth margined sheaths. Anteriorly the foot tapers to a fine rounded point, the apex of which is very shallowly sinuate; above this sinus is the minute head with its thickened anterio-lateral margins in place of distinct oral tentacles.

The colour of this species varies from chrome yellow to pale cream or white. The rhinophores and branchiae are always pale brown or fawn. As in other species of the genus, the underside of the mantle shows a tracery of narrow fibrillae, which in this case gave rise to the specific name *staminea*.

Localities: Fiddlers Bay, Spencer Gulf, (7 specimens, Dec. 1958, coll. P. Trenberth, F20, 767); Coobowie, St. Vincent Gulf, (3 specimens, Dec. 1957, coll. Hartley—Hall, F20, 768).

Station: At the former locality the species is collected in conjunction with a sponge of a similar colour, the latter specimens were taken under stones at low tide level.

Remarks: Basedow and Hedley (1905, p. 151) described this species as an *Archidoris*, apparently being misled by the presence of papillae upon the mantle, and further on (p. 157) included a form of *D. staminea* with "*Doriopsis*" *carneola* (Angas, 1864). O'Donoghue (1929, p. 812) was the first to realise that the species was not an *Archidoris* but failed to rectify the situation. Recently the author has recorded the species from Victorian localities and at that time regarded it as a *Dendrodoris*, but now he finds that it is a true *Doriopsilla*. Probably it is very closely related to the type of the genus, *D. areolata* Bergh, 1880, from the Atlantic Ocean and Mediterranean Sea, and may in fact prove to be synonymous with that species.

DORIOPSILLA AUREA (Quoy and Gaimard).

Doris aurea Quoy and Gaimard, 1832, *Voy. "Astrolabe"*, Zool. 2, p. 265, pl. 19, figs. 4-7.

This and the next species are very similar to one another but generally this is the larger and less brittle. The head is minute, the mantle is tough and has a very few low soft papillae scattered over it. Dimensions of the present specimen are 19 x 8 x 3 mm.

The colour is pale pink as preserved. When alive the colour is either orange or red, sometimes with white punctae scattered over it, usually these are surmounted on the papillae. The rhinophores and branchiae are reddish-brown.

Locality: Coobowie, St. Vincent Gulf, (1 specimen, December 1957, coll. Hartley–Hall F20, 855).

Station: Under stone at low tide.

Remarks: The next species differs from this in that the mantle and foot are always of different colours, whereas here the whole body is the one colour.

DORIOPSILLA CARNEOLA (Angas).

Doris carneola Angas, 1864, *J. Conchyliol,* 12, p. 48, pl. 4, fig. 7.

This species always retains the striking dark red or maroon colour of the mantle, the somewhat paler red underside of the mantle and the yellow, cream or white foot. The rhinophores and branchiae are a similar dark red or maroon as is the mantle. Dimensions of the larger specimen in the collection are 24 x 15 x 6 mm. The mantle is very hard and minutely granular.

Locality: Coobowie, St. Vincent Gulf, (2 specimens, Dec. 1957, collected Hartley–Hall, F20, 856).

Station: Under stones at low tide.

Remarks: The dimensions mentioned above are very rarely exceeded by this species. It is apparently quite common all along the southern Australian coastline, extending as far eastwards as Sydney Harbour. Angas in his type figure shows large rhinophoral sheaths, a feature not so noticeable in any of the many specimens examined by the author.

List of Abbreviations used in Text Figures.

(Text figs. 1-16).

a—albumen gland.
d—uterine duct.
gv—vestibular glands.
h—hermaphrodite duct.
l—ampulla.
m—mucus gland.
o—oviduct.
p—penis.
pg—penial gland.
pr—prostate gland.
ps—penial sheath.
sc—spermatocyst.
sp—spermatheca.
v—vagina.
vd—vas deferens.
♀—female aperture.
♂—male aperture.

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PLATE 1.

Fig. 1. *Hypselodoris saintvincentius* sp. nov. dorsal view.
Fig. 2. *Hypselodoris saintvincentius* sp. nov. lateral view.
Fig. 3. *Asteronotus (Tumbia) tremberthi* sp. nov. dorsal view.
Fig. 4. *Asteronotus (Tumbia) tremberthi* sp. nov. lateral view.
Fig. 5. *Asteronotus (Tumbia) tremberthi* sp. nov. ventral view.
Fig. 6. *Anisodoris flindersi* sp. nov. dorsal view.
Fig. 7. *Anisodoris flindersi* sp. nov. lateral view.

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